McVan Instruments PTY LTD

McVan Instruments Pty. Ltd.

58 Geddes Street, Mulgrave, Australia 3170

Telephone: + 61-3-561 2888

Facsimile: + 61-3-560 1164

~~03 561 2888~~

03 9582 7333

Model bwd 5B

SERVICE

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INSTRUMENT HANDBOOK

MODEL bwd 5B
DC to 30MHz PLUG-IN MODULE

1. GENERAL

1.1. Model bwd 5B module provides a sensitivity range from 5mV/cm to 20V/cm. From 5mV to 20mV the bandwidth is DC to >10MHz and DC to >30MHz from 50mV to 20V/cm. A single attenuator control covers both ranges without additional switching, thus providing direct reading calibration.

The three position input selector switch provides AC-DC-OFF; the latter position is useful for finding the zero input reference level without disconnecting the input signal.

Low drift and noise is achieved by using matched components throughout the input stages and thermally linked FET's and transistors to equalise temperature changes.

The COMMON line of this amplifier is DC isolated from chassis enabling DC measurements to be made at potentials up to ±400V from ground even when 100V p-p AC is superimposed.

Full application details of bwd 5B are contained in the 521 main frame handbook.

2. SPECIFICATION

2.1. Vertical Amplifier - 50mV to 20V/cm Range

Bandwidth	DC or 2Hz (AC coupled)to 30MHz - 3db referred to 6cm deflection at <50kHz.
Sensitivity Range	50, 100, 200, 500mV, 1, 2, 5, 10, 20 per cm with 2.5 - 1 Vernier between each step.
Rise Time	11 nanoseconds for 5cm deflection.
Calibration	Better than 3% +ve input.

2.2. 5 to 20mV Range

Bandwidth	DC to >10MHz - 3db.
Sensitivity	5, 10 and 20mV/cm.
Rise Time	<30 nanoseconds.
Calibration	5%.

GENERAL	Shift range ± 6cms minimum.
Input Impedance	1MΩ and approximately 35pF single ended.
Max. Input Voltage	400DC or 250AC to + or - input socket.
Common Terminal to Ground	0.6μF. Maximum voltage common to ground ±400V DC. Maximum AC 100V p-p. Max. DC + AC ±400V Peak.
Hum & Noise	Generally below 200μV p-p.
Input Selection	AC - DC - OFF (input to socket is isolated, internal circuit is grounded in OFF POSITION).
NOTE:	All above measurements are taken with Vernier control at CAL.

3. FUNCTION OF CONTROLS

3.1. Volts/cm (Attenuator)

Switch adjusts the sensitivity of the Vertical Amplifier from 5mV per cm to 20V per cm in a 1, 2, 5, 10 series of steps. Attenuator accuracy is 2% and the overall oscilloscope accuracy is within 3% on any step.

Attenuator Vernier

Adjusts the vertical gain over approx. 2.5 - 1 range between the attenuator steps.

AC - DC - OFF

In the DC position, amplifier is directly coupled from input to output. In the AC position a capacitor is placed in series with the input to eliminate any DC component and attenuate all frequencies below 2Hz.

Shift Moves the trace up and down minimum of ± 5cms.

CAL (Preset)

Adjusts the amplifier sensitivity of all ranges simultaneously.

BAL (Preset)

Adjusts the DC balance to eliminate vertical movement when the attenuator range switch is changed from 20mV to the 50mV step. Vernier gain control may cause trace to move vertically slightly when the attenuator is balanced - this is normal.

3.2. Terminals and Sockets Front Panel

Vertical Input Co-ax socket.

A positive input will cause the trace to move upwards. A negative input will cause the trace to move downwards.

Common

Black Terminal, should be connected to the ground side of the signal being measured. This terminal is not connected to the oscilloscope chassis and may be taken to ±400V from ground. Common terminal on main frame is isolated from ground.

3.3. First Time Operation - See bwd 521 main frame handbook.

3.4. Maintenance and Adjustments - See Section 5.

4. CIRCUIT DESCRIPTION

4.1. NOTE: As the circuit is isolated from ground, panel grounding link on main frame should be in place to enable measurements to be made with respect to chassis.

4.2. Vertical Amplifier

The input terminal is connected to the AC - DC - OFF slide switch S201. In the DC position, C201 is by-passed, but in the AC position it blocks DC and very low frequency signals. From S201 the signal passes through the attenuator S203A to E which attenuates the inputs in a 1, 2, 5, 10, 20, etc. ratio. S203A - D attenuate the input signal, whilst S203E switches in RV206 to increase the amplifier gain by X10 on the three most sensitive positions, i.e. 5, 10 and 20mV/cm.

4.3. The amplifier consists of an FET source follower driving an emitter follower pair. The amplifier stage is a series - shunt wideband compensated stage followed by an output emitter follower and trigger take off.

Q201 and 202 are a matched pair of junction FET transistors. Neon B201 clamps the inputs to protect the input stage, in the event of an overload voltage or transient exceeding +12V or -50V. A front panel balance control RV202 balances the input FET's by adjustment of the standing current. Output from Q201 and 2 is directly coupled to a matched pair of PNP transistor emitter followers Q203 and 4. The front panel CAL control and vernier gain control are placed between the emitters after build out resistors R241 and 243, and form a low impedance attenuator which enables the gain to be adjusted without affecting bandwidth.

4.4. The two stage amplifier Q205, 6, 7 and 8 is a series-shunt compensated circuit. Q205 and 6 balanced pair are series compensated between their emitters. R250 and R249 set the stage gain and RV204 and C251 are adjusted for optimum high frequency response.

Attenuator section S203E switches in RV206 preset gain control, which is adjusted to increase the amplifier gain by X10 in the 5, 10 and 20mV positions. However, when the gain is increased the bandwidth falls to approximately 12MHz for the three most sensitive positions.

Q207 and 8 have negative feedback provided by shunt feedback resistors R257 and 260 connected between base and collector of balanced pair. Shift is applied to the base of Q207 and 8 by R254 and 256 build-out resistors from RV207 shift control.

Output drivers Q209 and 10 feed the output amplifiers located in the main frame and provide the drive for the trigger take off divider R279, R270, C255, R205 and zero level control RV209. Trigger drive is provided at low impedance by Q212 emitter follower. Q211 emitter follower maintains a stable low impedance DC rail for the amplifier and output transistors.

5. ADJUSTMENTS & MAINTENANCE

5.1. Balance Control

Turn Attenuator to 50mV. Centre trace with shift, switch atten. to 20mV position. If trace moves turn BAL control to recentre trace. Repeat as necessary to obtain balance. Check vernier control. Trace should not move more than 1cm when control is rotated. Replace Q205 and 6 with a matched pair if movement is excessive.

5.2. Calibration (50mV - 20V)

Switch the input selector to DC. Set attenuator to 1V/cm Vernier fully clockwise at CAL. Adjust CAL control for 5cm deflection when 5V CALIBRATE signal is applied.

5.3. Calibration (5mV to 20mV)

Remove LH cover from instrument. Turn attenuator to 10mV/cm position, input selector to DC, Vernier control fully clockwise in CAL position. Feed in 50mV calibrate signal to input, adjust RV206 on P/C board for 5cm deflection.

NOTE: Narrow band calibration must be done after the wide band calibration procedure above.

To set X10 calibration on lower beam amplifier remove upper beam amplifier from main frame and proceed as previously detailed.

NOTE: Model bwd 521 main frame will operate quite normally with or without plug-in fitted, and although not recommended as a normal procedure, plug-ins can be interchanged whilst instrument is operating.

5.4. DC Balance

Measure mean DC potential at collectors of vertical output amplifiers in main frame at take off point to CRT deflection plates. Adjust shift control until voltages are equal; this should be +50V ± 1V; if incorrect adjust RV208 on 5B plug-in board for correct operating potential.

To reset lower beam display, remove upper beam plug-in from main frame to obtain access.

5.5. Response

Turn Vernier control to CAL position. Attenuator to 50mV/cm, input AC coupled. Feed in a correctly terminated 1MHz square wave, 250mV amplitude (i.e. 5cm deflection) with a rise time of <5 nanoseconds.

NOTE: Co-ax line from generator must be accurately terminated to eliminate ringing in line and should have a known clean shape free of over or under-shoot. R204 and C257 are adjusted to obtain a clean waveform with minimum ringing, over or under shoot at the leading edge. Check bandwidth after square wave alignment. A 50kHz sine wave of 6cms amplitude should not drop to less than 4.2cm at 30MHz.

Now switch attenuator to 5mV; 6cm at 50kHz should not drop to less than 4.2cm at 10MHz.

5.6. Trigger Level Adjust

Equalise DC potential of output amplifier collectors in main frame with the vertical shift control. Now set RV209 to bring potential in pin 12 of output socket to OV with respect to chassis. Repeat for each amplifier.

5.7. Attenuator Alignment - Test equipment required: (a) 1 to 5kHz square wave generator with fast rise time, output amplitude from 200mV to 100V p-p; (b) capacitance meter reading from 20 to 60pF or a 10 - 1 high impedance probe (bwd P22).

5.8. Method - Remove upper beam plug-in amplifier, fit 5B amplifier to be aligned in centre cavity (lower beam). Set attenuator to 50mV, Vernier to CAL, Input Select to AC, centre with shift.

Feed in 200mV square wave (approx. 2kHz) to check shape of generator. The following table indicates the capacitor adjustment required for each attenuator step.

5.9.

ATTEN. STEP	INPUT VOLTAGE	RESPONSE ADJ.	INPUT CAP. ADJ.
5mV	20mV	None	None
10mV	50mV	C208	C205
20mV	100mV	C209	C206
50mV	200mV	None	None
100mV	500mV	None	None
200mV	1V	None	None
500mV	2V	C214	None
1V	5V	C212	None
2V	10V	None	None
5V	20V	C216	None
10V	50V	C210	None
20V	100V	None	None

5.10. Two methods of input capacitance alignment are available as detailed below:

(a) Measure input capacitance with instrument operating at 5 or 50mV attenuator setting, then adjust C205 and 206 on the range indicated above to equalise the input capacitance on the two ranges.

(b) Connect a X10 probe (bwd P22) to the co-ax input socket. Set atten. to 5mV, couple probe to square wave generator (200mV, 1kHz output) and adjust probe compensation for optimum square wave. Now turn attenuator to 10mV step and adjust C205 for clear wave free of under or overshoot. Repeat at 20mV by adjusting C206.

bwd 5B Plug-in
AMPLIFIER
SHOWING LOCATION OF COMPONENTS

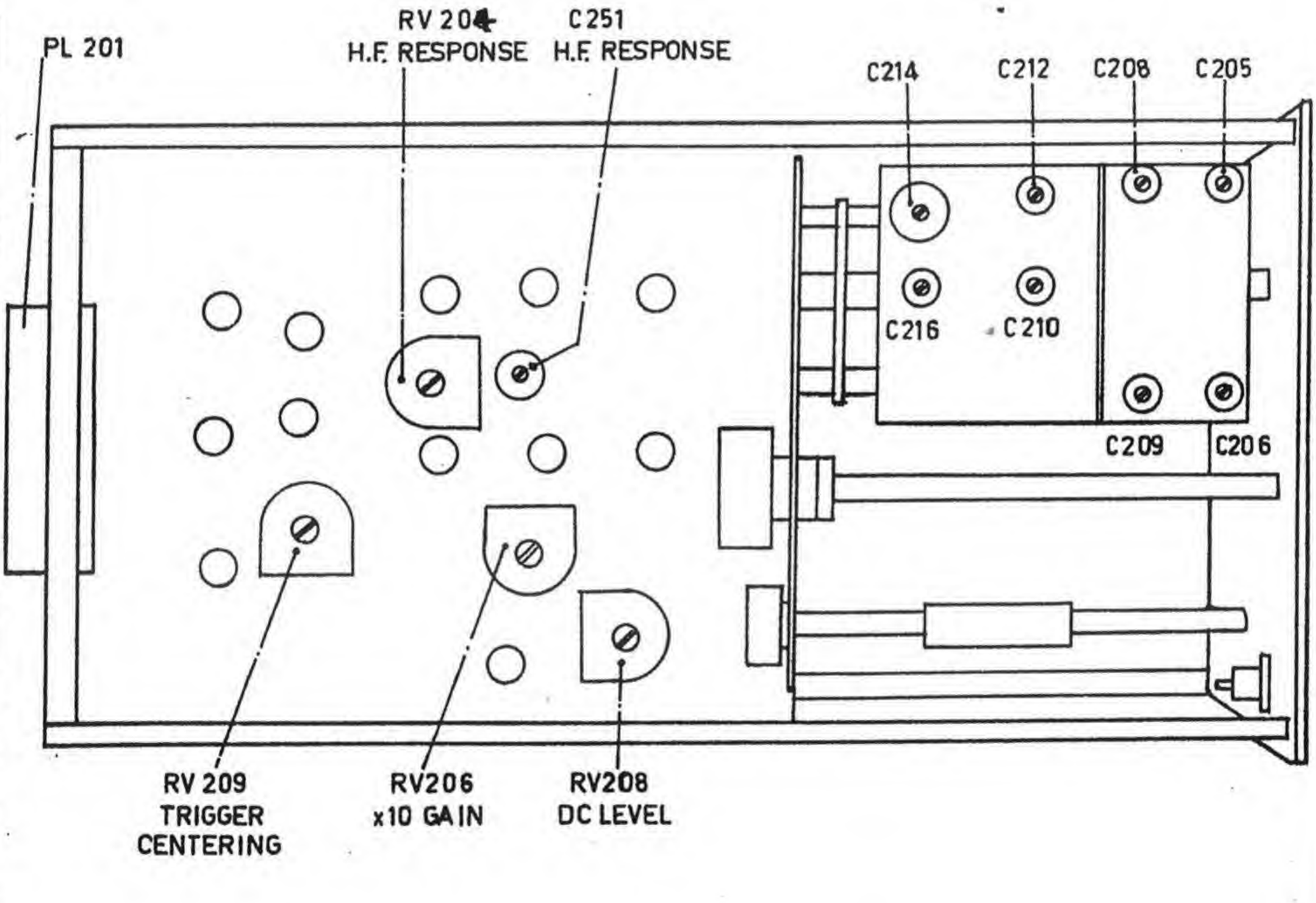


Fig 1

5.11. NOTE: Amplifiers may be interchanged from one main frame to another without affecting the overall rise time or bandwidth. However, the calibration may need adjusting by the panel CAL control.

6. REPLACEMENT PARTS

Spares are normally available directly from the manufacturer, B.W.D. ELECTRONICS PTY. LTD. When ordering, it is necessary to indicate the serial number of the instrument. If exact replacement parts are not to hand, locally available alternatives may be used, provided they possess a specification not less than, or physical size not greater than, the original components.

As the policy of B.W.D. ELECTRONICS PTY. LTD. is one of continuing research and development, the company reserves the right to supply the latest equipment and make amendments to the circuits and parts without notice.

7. WARRANTY

The equipment is guaranteed for a period of twelve (12) months from the date of purchase, with the exception of cathode ray tubes, which are covered by their manufacturers own warranty.

Please refer to Guarantee Registration Card No. ..... which accompanied instrument for full details of conditions of warranty.

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B.W.D. ELECTRONICS PTY. LTD.

REPLACEABLE PARTS

1. This section contains information for ordering replacement parts, it provides the following details:-

   (a) Description of part (see list of abbreviations).
   (b) Typical manufacturer or supplier of the part (see list of abbreviations).
   (c) Manufacturer's Part Number; and
   (d) Defence Stock Number, where applicable.

2. Ordering - Please quote Model Type No. e.g. bwd 511, Serial No., Circuit reference No. and component details as listed in parts list.

COMPONENT DESIGNATORS

A	Assembly	H	Heater	RV	Resistor Variable
B	Lamp	J	Jack (socket)	S	Switch
C	Capacitor	L	Inductor	T	Transformer _
D	Diode	M	Meter	TH	Thermistor
DL	Delay Line	P	Plug	V	Valve
E	Misc.Elect.Part	Q	Transistor	VDR	Voltage Dependent Resistor
F	Fuse	R	Resistor		

ABBREVIATIONS

Amp	Ampere	L	Inductor
C	Capacitor	lin	Linear
cc	Cracked Carbon	Log	Logarithmic Taper
c	Carbon	m	Milli = 10^{-3}
cd	Deposited Carbon	MHz	Mega Hertz = 10^{6}Hz
comp	Composition	MF	Metal Film
CDS	Ceramic Disc Capacitor	ma	Milli Ampere
cer	ceramic	MΩ	Meg Ohm = $10^{6}\Omega$
Com	Common	mfr	Manufacturer
DPST	Double Pole Single Throw	MO	Metal Oxide
DPDT	Double Pole Double Throw	MHT	Polyester/Paper Capacitor
elec	Electrolytic	MPC	Metalised Polyester Capacitor
F	Farad	Ne	Neon
f	Fuse	NPO	Zero temperature co-efficient
FET	Field Effect Transistor	nsr	Not separately replaceable
Ge	Germanium	NC	Normally Closed
H	Henry (ies)	NO	Normally Open
H.S.	High Stability	ns	Nano second
HTC	High Temp Coating	obd	Order by Description
ins	Insulated	OD	Outside Diameter
kHz	Kilo Hertz = 10^{3}Hz	p	Peak
KΩ	Kilohm = $10^{3}\Omega$	pf	pico farad = 10^{-12}F

ABBREVIATIONS CONTINUED

PL	Plug
PS	Socket
Preset	Internal Preset
PYE	Polyester
pot	Potentiometer
prec	Precision
PC	Printed Circuit
PIV	Peak Inverse Voltage
PYS	Polystyrene
p-p	Peak to Peak
P.Shaft	Plain Shaft
S.Shaft	Slotted Shaft
R	Resistor
rot	Rotary
R log	Reverse Logarithmic Taper
rms	Root Mean Squared
Se	Selenium
SI	Slide
SPDT	Single Pole Double Throw
SPST	Single Pole Single Throw
si	Silicon
Ta	Tantalum
tol	Tolerance
trim	trimmer
V	Volt (s)
var	variable
vdcw	Volts Direct Current Working
w	Watt (s)
ww	Wire Wound
Z	Zener
*	Factory Selected valve average valve may be shown
**	Special Component, no part number assigned

MANUFACTURER ABBREVIATIONS

AC	Allied Capacitors
AEE	AEE Capacitors
AN	Anodeon
AST	Astronic Imports
AWA	Amalgamated Wireless of Aust.
ACM	Acme Engineering Pty.Ltd.
AMP	Aircraft Marine Products (Aust)P/L
AR	A. & R. Transformers
AUS	Australux Fuses
AWV	Amalgamated Wireless Valve Co.
ACA	Amplifier Co. of Aust.
AL	Alpha
ARR	Arrow
BWD	B.W.D. Electronics Pty.Ltd.
BL	Belling & Lee Pty.Ltd.
BR	Brentware (Vic) Pty.Ltd.
CF	Carr Fastener
CAN	Cannon Electrics Pty.Ltd.
CIN	Cinch
D	Ducon Condensor Pty.Ltd.
DAR	Darstan
DIS	Distributors Corporation Pty.Ltd.
ELN	Elna Capacitors (Sonar Elect.P/L)
ETD	Electron Tube Dist.
F	Fairchild Australia Pty.Ltd.
GRA	General Radio Agencies
GES	General Electronic Services
GL	Grelco
HW	Hurtle Webster
HOL	R.G. Holloway
H	Haco Distributors (National)
J	Jabel
MAS	Master Instrument Co. Pty.Ltd.
MUL	Mullard (Aust.) Pty.Ld.
MOR	Morganite (Aust.) Pty.Ltd.
MSP	Manufacturers Special Products (AWA)
McM	McMurdo (Aust.) Pty.Ltd.
NU	NU VU Pty.Ltd.
NAU	A.G. Naunton Pty.Ltd.
PA	Painton (Aust.) Pty.Ltd.
PAL	Paton Elect. Pty.Ltd.
PI	Piher Resistors (Sonar Electronics)
PW	Precision Windings Pty.Ltd.
PH	Philips Electrical Industries Pty.Ltd.
PL	Plessey Pacific
PV	Peaston Vic
RP	Radio Parts Pty.Ltd.
RC	Radio Corporation (Electronic Inds.)
RCA	Radio Corporation of America
RHC	R.H. Cunningham
S	Sonic Electronics Pty.Ltd.
STC	Standard Telephones & Cables
SI	Siemens Electrical Industries
SIM	Simonson Pty.Ltd.
SE	Selectronic Components
TR	Trimax Erricson Transformers
TI	Texas Instruments Pty.Ltd.
TH	Thorn Atlas
UC	Union Carbide
W	Wellyn Resistors (Cannon Elec.P/L)
Y	F.L. Yott Pty.Ltd.
Z	Zephyr Prod. Pty.Ltd.

B.W.D. ELECTRONICS PTY.LTD. - PARTS LIST

MODEL bwd 5B PLUG-IN

CCT Ref.	DESCRIPTION				Mfr. or Supply	PART No.	
	RESISTORS						
R201	33Ω	½W	10%	C	MOR		
R202	750KΩ	¼W	1%	HS	W	C21	
R203	500KΩ	¼W	1%	HS	PA	Type 72	
R204	500KΩ	¼W	1%	HS	W	C21	
R205	333KΩ	¼W	1%	HS	PA	Type 72	
R206	33Ω	¼W	10%	C	MOR		
R207	900KΩ	¼W	1%	HS	PA	C21	
R208	990KΩ	¼W	1%	HS	PA	C21	
R209	111KΩ	¼W	1%	HS	W	Type 72	
R210	10.1KΩ	¼W	1%	HS	PA	Type 72	
R211	1MΩ	¼W	1%	HS	W	C21	
R212							
to							
R228							
R229	220KΩ	½W	5%	CC	PI		
R230	220KΩ	½W	5%	CC	PI		
R231	47Ω	½W	5%	CC	PI		
R232	47Ω	½W	5%	CC	PI		
R233	12KΩ	½W	5%	CC	PI		
R234	12KΩ	½W	5%	CC	PI		
R235	10KΩ	½W	5%	CC	PI		
R236	10KΩ	½W	5%	CC	PI		
R237	47Ω	½W	5%	CC	PI		
R238	47Ω	½W	5%	CC	PI		
R239	33Ω	½W	5%	CC	PI		
R240	3.3KΩ	½W	5%	CC	PI		
R241	100Ω	½W	5%	CC	PI		
R242	100Ω	½W	5%	CC	PI		
R243	100Ω	½W	5%	CC	PI		
R244	3.3KΩ	½W	5%	CC	PI		
R245	1.5KΩ	½W	5%	CC	PI		
R246	560Ω	½W	5%	CC	PI		
R247	2.2KΩ	½W	5%	CC	PI		
R248	2.2KΩ	½W	5%	CC	PI		
R249	56Ω	½W	5%	CC	PI		
R250	33Ω	½W	5%	CC	PI		
R251	47Ω	½W	5%	CC	PI		
R252	560Ω	½W	5%	CC	PI		

B.W.D. ELECTRONICS PTY.LTD. - PARTS LIST bwd 5B PLUG-IN

CCT Ref.	DESCRIPTION				Mfr. or Supply	PART No.	
	RESISTORS						
R253	1.5KΩ	½W	5%	CC	PI		
R254	33KΩ	½W	5%	CC	PI		
R255							
R256	33KΩ	½W	5%	CC	PI		
R257	3.3KΩ	½W	5%	CC	PI		
R258	47Ω	½W	5%	CC	PI		
R259	47Ω	½W	5%	CC	PI		
R260	3.3KΩ	½W	5%	CC	PI		
R261	22KΩ	½W	5%	CC	PI		
R262	1.2KΩ	½W	5%	CC	PI		
R263							
R264	1KΩ	½W	5%	CC	PI		
R265							
R266	1.2KΩ	½W	5%	CC	PI		
R267	4.7KΩ	½W	5%	CC	PI		
R268	3.9KΩ	½W	5%	CC	PI		
R269	2.2KΩ	½W	5%	CC	PI		
R270	18KΩ	½W	5%	CC	PI		
R271	47Ω	½W	5%	CC	PI		
R272	47Ω	½W	5%	CC	PI		
R273	47Ω	½W	5%	CC	PI		
R274	47Ω	½W	5%	CC	PI		
R275	47Ω	½W	5%	CC	PI		
R276							
R277							
R278							
R279	270Ω	½W	5%	CC	PI		
R280	47Ω	½W	5%	CC	PI		
R281	47Ω	½W	5%	CC	PI		
R282	33Ω	½W	5%	CC	PI		
R283	680Ω	½W	5%	CC	PI		
R284	33Ω	½W	5%	CC	PI		
R285	47K	½W	5%	CC	PI		
R286	47Ω	½W	5%	CC	PI		
R287							
R288							
R289							
R290							

B.W.D. ELECTRONICS PTY.LTD. - PARTS LIST bwd 5B PLUG-IN

CCT Ref.	DESCRIPTION					Mfr. or Supply	PART No.	
	CAPACITORS							
C201	.1 uF	400V	10%		PYE	PH	C296 AC/A100K	
C202	.0033	400V	10%		PYE	PH	C296 AC/A3K3	
C203	10 pf	500V	10%	NPO	CDS	D or AC	CDS	
C204	33 pf	500V	5%	NPO	CDS	D or AC	CDS	
C205	1-10pf	TRIM				PH	C010 EA/10E	
C206	2-20pf	TRIM				PH	C010EA/20E	
C207	.001 uF	500V	20%		CDS	AC	CDS	
C208	2-20pf	TRIM				PH	C010EA/20E	
C209	2-20pf	TRIM				PH	C010 EA/20E	
C210	1-10pf	TRIM				PH	C010 EA/10E	
C211	.001	500V	20%		CDS	AC	CDS	
C212	1-10pf	TRIM				PH	C010 EA/10E	
C213	5.6pf	500V	10%	NPO	CDS	AC	CDS	
C214	5-60pf	TRIM		NPO		PH	C010 GA/60E	
C215	10pf	500V	10%	NPO	CDS	AC	CDS	
C216	1-10pf	TRIM				PH	C010 EA/10E	
C217	470 pf	500V	10%	S.MICA		D	MSA	
C218								
to								
C244								
C245	.0022 uF	500V	20%		CDS	AC	CDS	
C246								
C247	.1 uF	50V			CDS	AC	CDS	
C248	125 uF	16V	elec			PH	C426 AR/E125	
C249	.001 uF	500V	20%		CDS	AC	CDS	
C250	.001 uF	500V	20%		CDS	AC	CDS	
C251	2-20	TRIM				PH	C010 EA/20E	
C252								
C253	125 uF	16V	elec			PH	C426 AR/E125	
C254	.1 uF	50V			CDS	AC	CDS	
C255	10 pf	500V	10%	NPO	CDS	AC	CDS	
C256	64 uF	64V	elec			PH	C437 AR/H64	
C257	.01 uF	160V	10%		PYE	PH	C296 AA/A10K	
C258	.22 uF	630V			MPC	PH	280 CG/P220K	
C259	.22 uF	630V			MPC	PH	C280 CG/P220K	
C260	.22 uF	630V			MPC	PH	C280 CG/P220K	
C261								
C262								

B.W.D. ELECTRONICS PTY.LTD. - PARTS LIST bwd 5B PLUG-IN

CCT Ref.	DESCRIPTION	Mfr. or Supplier	PART No.	
	POTENTIOMETERS			
RV201				
RV202	5 KΩ LIN C	IRC	CTS200	
RV203	5 KΩ LIN C	IRC	CTS200	
RV204	2.2 KΩ LIN PRESET C	PH	E097 AD/2K2	
RV205	1 KΩ Rev Log with P-PULL DP ST SW	D	PSP	
RV206	100Ω LIN PRESET C	PH	E097 AD/100E	
RV207	50 KΩ LIN C	D	PSU	
RV208	22 KΩ LIN PRESET C	PH	E097 AD/22K	
RV209	22 KΩ LIN PRESET C	PH	E097 AD/22K	
	TRANSISTORS			
Q201	N CHANNEL FET	TI	2N3819(1)	
Q202	N CHANNEL FET	TI	2N3819(1)	
Q203	20V Vce hfe 100 PNP	F	AY1114(2)	
Q204	20V Vce hfe 100 PNP	F	AY1114(2)	
Q205	20V Vce hfe 40 NPN	F	AY1119(3)	
Q206	20V Vce hfe 40 NPN	F	AY1119(3)	
Q207	45V Vce hfe 40 NPN	F	AY1101/2N3694	
Q208	45V Vce hfe 40 NPN	F	AY1101/2N3694	
Q209	20V Vce hfe 40 NPN	F	AY1119	
Q210	20V Vce hfe 40 NPN	F	AY1119	
Q211	25V Vce hfe 100 NPN	F	AY1113	
Q212	45V Vce hfe 40 NPN	F	AY1101/2N3694	
	(1) Matched Pairs			
	(2) Matched Pairs			
	(3) Matched Pairs			
	NEONS			
B201	50V selected NE2 or CC3L	D	NE2	
	SUNDRY			
S201	3 POSITION 2 POLE SLIDE SW	H	RQ153S	
S203	5 DECK 12 POSITION ROTARY	bwd	SR66	
J201	BNC PANEL SOCKET	ACME	UG-1094/AU	
PL201	24 WAY RED RANGE PLUG	MCM	RP24	
J203	TERMINAL BLACK	ACME	052	
	ALL OTHER ITEMS, ORDER BY DESCRIPTION			

MODIFICATION
ISSUE 2 PRODUCTION
ISSUE 3 R 289 REMOVED R235 & 242 CORRECTED
ISSUE 4 Q 212 WAS AY1101
ISSUE 5 SER N° — C 257 REMOVED B 201 REMOVED R 282 REMOVED R233 & 234 WERE 12 K RV 201 ADDED D201 & 202 ADDED RV204 WAS 2·2 K

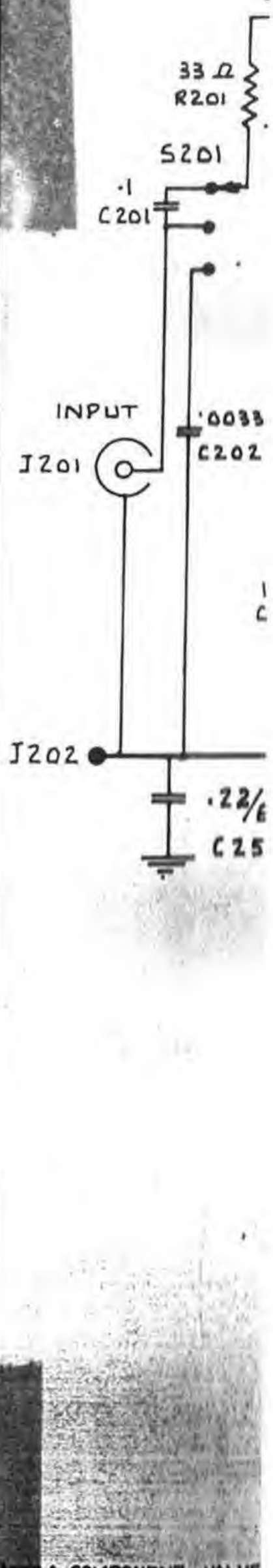
SWITCHES

S 201 AC-DC-GRN SELECTOR

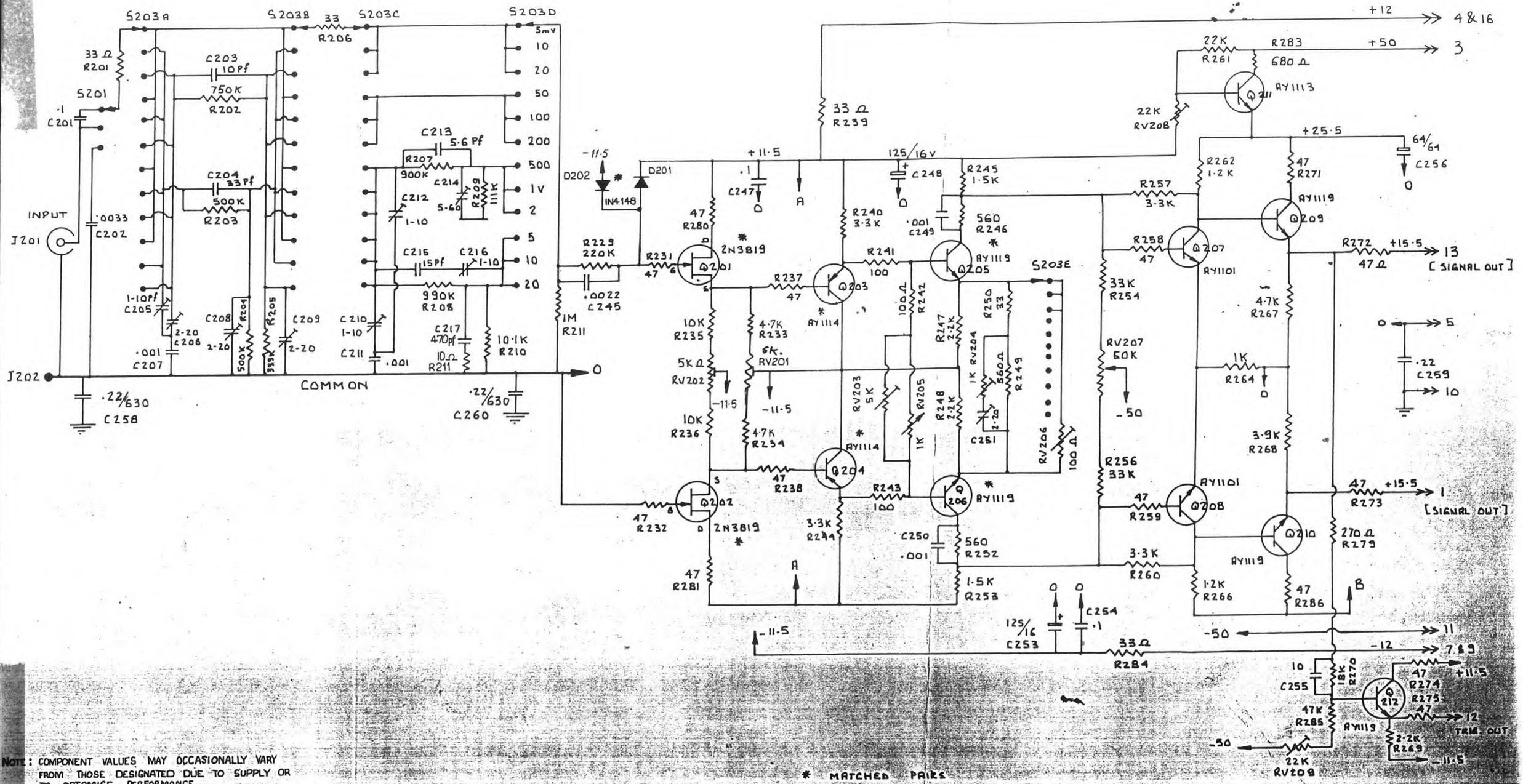
S 202A-E INPUT ATTENUATOR

CONTROLS

RV201	D.C. BALANCE (COARSE)
RV202	DC BALANCE (PANEL)
RV203	CALIBRATE [PANEL]
RV204	H.F RESPONSE
RV205	VERNIER GAIN CONTROL
RV206	X10 CALIBRATE PRESET
RV207	SHIFT CONTROL
RV208	D.C. OUTPUT LEVEL
RV209	TRIGGER OUTPUT LEVEL



NOTE : COMPONENT VALUE
FROM THOSE DE
TO OPTOMISE



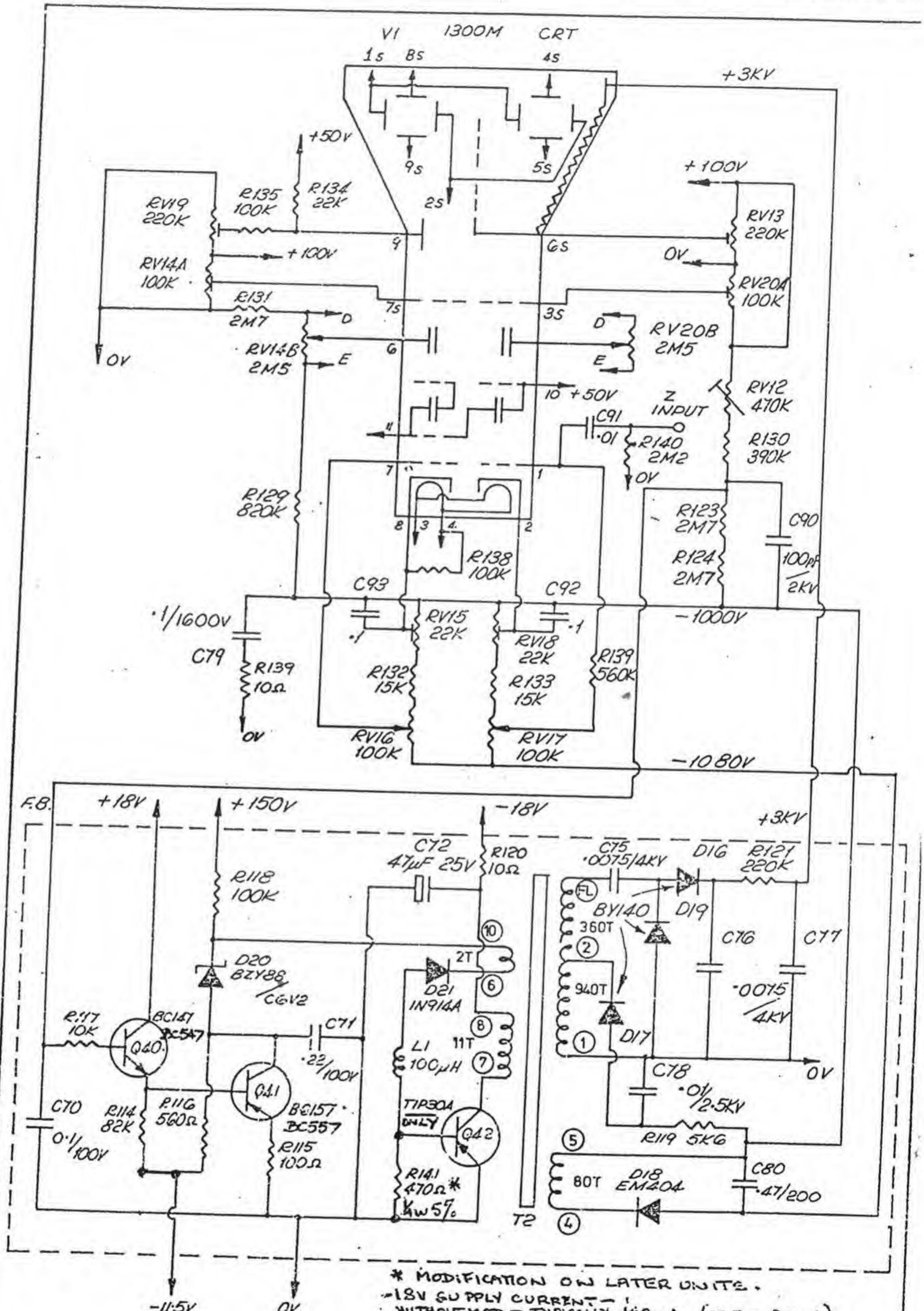
NOTE: COMPONENT VALUES MAY OCCASIONALLY VARY FROM THOSE DESIGNATED DUE TO SUPPLY OR TO OPTOMISE PERFORMANCE.

* MATCHED PAIRS



5 / 8-70	1 / 11-68	JB 11-68 TRACED N.A 17-11-69	5B AMPLIFIER AMPLIFIER DC-30 MHz

DRG Nº 683



ISSUE	521	BWD ELECTRONICS P/L. MELB. AUST.	DRG.NR
5 / 7-76	DRAWN BKT.	bwd MODEL 521 EHT	1065
	TRACED L.P.	SUPPLIES & CRT.	
	CHECKED BKT		
	DATE: 10-12-72		